

ABO DISCREPANCY IN RADIATION FIELD WORKER

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ABSTRACT

Background: The ABO system still remains the most important blood group system in transfusion medicine. There is reciprocal relationship between presence or absence of antigens on the red blood cells and antibodies in the serum. ABO discrepancy arises due to either weak/missing or additional antigen/antibody. Exposure to ionizing radiations including x-rays leads to abnormal haematological findings, cancer (including leukaemia), birth defects in the future children of exposed parents, and affect on immune system. There is no published report in Sudan addressing the effect of low dose radiation on ABO discrepancy. **Objectives:** To study the ABO discrepancy in radiation field workers using direct and indirect blood grouping. **Methods:** A comparative cross-sectional study with 60 participants in the period from August to December 2016 was carried out. Direct (cell grouping) and indirect blood ABO blood grouping (serum grouping) was done for each participant. **Results:** ABO grouping was done by forward and reverse grouping showed that five samples have Weak/absent reaction in serum grouping, tow patient sample have discrepancy they have missed antibodies and three samples have weak reaction in reverse grouping. The discrepancy is really affected by age and duration of exposure to radiation and there are significant correlation between it and other haematological change due to exposure to radiation. **Conclusion:** It is not deniable that low dose ionizing radiation is imposing impact on the ABO Blood group antigen and antibody of radiation field workers leads to discrepancy.

KEYWORDS: ABO discrepancy, low dose radiation.

INTRODUCTION

The ABO system was first described in 1900 by Karl Landsteiner and it still remains the most important blood group system in transfusion and transplantation medicine. Two key factors make ABO the most important blood group system in transfusion medicine. Firstly, almost without exception, the blood of adults contains antibodies to those ABO antigens lacking from their red cell, Due to this reciprocity, an ABO blood type determination is considered valid if serum grouping corresponds with the red blood cell antigen grouping. Secondly, ABO antibodies are invariably IgM, though they may also have an IgG component, activate complement, and cause immediate intravascular red cell destruction, which can give rise to severe and often fatal haemolytic transfusion reactions.

ABO discrepancies are recognized when the reactions obtained in the forward type do not "match" the reactions obtained in the reverse type, Red cell and serum test results may be discrepant because of intrinsic problems with red cells or serum, or technical errors. x ray radiation is considering one of causes of ABO discrepancy due to immune suppression action , so in

this study we want to study the effect of low dose of ionized radiation on ABO Group system.

Generally there are three medical practices involving exposure to ionizing radiation. These are diagnostic radiology (and image-guided interventional procedures), nuclear medicine and radiotherapy.

MATERIAL AND METHODS

Study site and population

Study design This study was conducted to assess effects of radiation on ABO antigen and antibody in radiation field workers as Cross sectional study. **Study population** Radiation field workers include Technologist, and other employer in department work more than five year in radiation field. All apparently healthy workers with work experience of five year and above were included.

Exclusion criteria

Pregnancy, known history of acute or chronic infection, autoimmune disease, malignancy, those who have taken radiotherapy or chemotherapy and who have exposed to mutagenic agent were our exclusion criteria.

Collection of blood samples

Two ml blood will be collect in Ethylene diamene tetra acetic acid (EDTA) and Two ml blood was collected in plain container through venipuncture from 60 occupationally exposed radiations as diagnostic workers. Each specimen bottle was labelled with the same identification code number and ABO forward grouping will be done from EDTA container, and reverse group was done from plain container to see is there are any discrepancy or no due to expose to low dose x ray radiation.

Statistical Analysis

Analysed results of the ABO grouping were entered into (R version 2.13.1 (2011-07-08) MASS package) Statistical Package for multivariate analysis at 95% confidant interval statistically significant. Statistical values for $p < 0.05$ were considered significant, and >0.05 were considered in significant

RESULTS AND DISCUSSION

ABO grouping was done by forward and reverse grouping showed that five sample have Weak/absent reaction in serum grouping, tow patient sample have discrepancy they have missed antibodies and showed no agglutination reaction in serum grouping while three samples showed have weak reaction in reverse grouping. The values for ABO discrepancy and age and duration of exposure to low dose radiation per year and hours per day working in table below*

| Parameter | P value |
|--|---------|
| Other haematological parameters | 0.000 |
| Age | 0.01 |
| Duration of exposure to low dose radiation per years | 0.007 |
| Hours per day of exposure to low dose radiation | 0.005 |

>0.05 no significant < 0.05 significant

The P value obtain from Other haematological parameter change and its decrease due to exposure to low dose radiation particularly TWBCs of the participants was 0.000 which is less than 0.05 that mean it is statistically strong significant. Then we conclude that there is a relation between the discrepancy and the haematological parameter change.

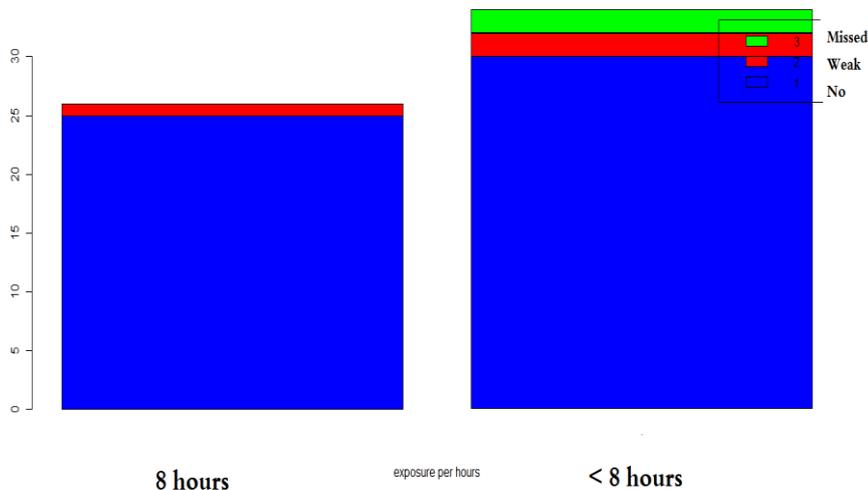
The p value obtained for the age of the participants was 0.01 which is less than 0.05 that mean it is statistically significant. Then we conclude that there is a relation between the ABO discrepancy and the age.

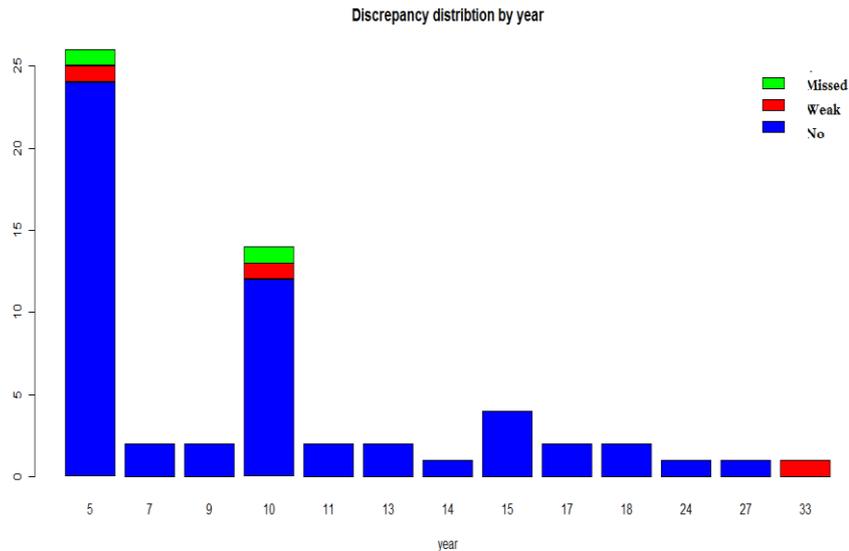
The p value obtained for Duration of exposure to low dose radiation per years was 0.007 which is less than 0.05 that mean it is statistically significant. Then we conclude that there is a relation between the discrepancy and the Duration for exposure to low dose radiation per years.

The P value obtain for Duration of hours per day exposure to low dose radiation was 0.005 which is less than 0.05 that mean it is statistically significant. Then we conclude that there is a relation between the discrepancy and the Duration of hours per day exposure to low dose radiation

The p values from multivariate analysis are statistically significant at 95 % confidence interval so we could not accept the null hyposis. Then the conclusions will be that the discrepancy is really affected by all previous mentioned factors.

Discrepancy distribution by exposure per hours





X ray radiation has potential effect on living cell and can make functionally abnormal cells by the free radical mechanism. Long-term exposure to radiation may affect cells and tissues and result in various adverse health effects. Keeping in view the effects of exposure to ionizing radiation. The presented studies incorporated basic haematological parameters count. Immune suppression is consequence of whole body radiation at medium or high dose, in contrast, it has been reported very low dose of ionized radiotherapy may give rise to immune stimulatory effect particularly at short time after radiation these result study on animal but the evidence for similar effect on human immune system is sparse. although few data are available on the effects of low dose exposure on human some reports suggest that chronic low dose radiation exposure can lead to effects on the human immune system , Immune status was evaluated by Godekmerdan *et al.* In 50 radiology workers [G26] a decrease level of immunoglobulin's (IgA , IgG , IgM) and complement (C3 and C4) was found suggesting impairment of cellular and humeral immunity .epidemiological findings suggest that the radiation induced impairment of immunocompetence may increase the risk of disease that normally occur in elderly people the data review indicate that exposure to ionizing radiation often leads to immunosuppression [ANNEX D Effects of ionizing radiation on the immune system].

ABO blood group is most important group system in transfusion and transplantation; althoughno study addressed the effect of low dose radiation on ABO Ag or Abs. Our study found significant correlation between low dose radiation and ABO discrepancy and there was relationship between discrepancy and age and duration of exposure to radiation and other haematological parameter change due to exposure to radiation.

CONCLUSION

In conclusion, we recommended that radiation field workers should regularly use appropriate personal protective equipment at their work site and should get periodic medical surveillance including ABO blood grouping forward and reverse grouping . These measures would help to decrease the effects of occupational hazards of radiation and detect the disease in initial stage when treatment is achievable in cement industrial workers. And they must work fewer hours per day to decrease exposure to radiation.

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